

## **Rad-Tolerant PWM Controller And GaN FET Driver Come In Plastic Packages For SmallSats**

[Renesas Electronics'](#) ISL71043M and ISL71040M are described as the space industry's first plastic-packaged, radiation-tolerant PWM controller and GaN FET driver for dc-dc converters in small satellites (smallsats) and launch vehicles. The ISL71043M single-ended current-mode PWM controller and the ISL71040M low-side GaN FET driver are well suited for isolated flyback and half-bridge power stages, and motor control driver circuits in satellite buses and payloads (see the figure).

Private "new space" companies have begun launching smallsats to form large constellations operating in multiple low Earth orbit (LEO) planes. Smallsat mega-constellations provide global broadband Internet links, as well as high-resolution Earth observation imaging for sea, air, and land asset tracking.

The ISL71043M PWM controller provides fast signal propagation and output switching in a small 4-mm x 5-mm SOIC plastic package, reducing PCB area up to 3x compared to competitive ceramic packages, according to the company. In addition, the ISL71043's 5.5-mA max supply current reduces power loss more than 3x, and its adjustable operating frequency—up to 1 MHz—enables higher efficiency and the use of smaller passive filter components.

The ISL71043M and ISL71040M are characterization tested at a total ionizing doze (TID) of up to 30 krad(Si), and for single event effects (SEE) at a linear energy transfer (LET) of 43 MeV•cm<sup>2</sup>/mg. Both devices operate over an extended temperature range of -55°C to +125°C.

The ISL71040M low-side GaN FET driver safely drives Renesas' rad-hard GaN FETs in isolated topologies and boost-type configurations. The ISL71040M operates with a supply voltage between 4.5 V and 13.2 V, a gate-drive voltage ( $V_{DRV}$ ) of 4.5 V, and it includes both inverting and non-inverting inputs. The device's split outputs adjust the turn-on and turn-off speeds, and its high-current source and sink capability enables high-frequency operation.

The ISL71040M ensures reliable operation when driving GaN FETs by precisely controlling the gate driver voltage to +3/-5% over temperature and radiation. It also includes floating protection circuitry to eliminate unintentional switching.

"The ISL71043M and ISL71040M along with our GaN FETs and digital isolators give customers a size and cost-optimized power supply solution for large constellations of smallsats," said Philip Chesley, vice president, Industrial Analog and Power Business Division, Renesas Electronics. "Renesas' radiation-tolerant plastic package flow and cutting-edge IC technology provides the optimal cost and radiation performance new space customers demand for 5-year mission profiles in low Earth orbit."

Other features of ISL71043M PWM controller include an operating supply range of 9 V to 13.2 V, a 5.5-mA (max) operating supply current, a  $\pm 3\%$  current limit threshold, an integrated 1-A MOSFET gate driver with 35-ns rise and fall times at 1-nF output load, and a 1.5-MHz bandwidth error amplifier.

Other features of the ISL71040M low-side GaN FET driver include an operating supply range of 4.5 V to 13.2 V, an internal 4.5-V regulated gate-drive voltage, independent outputs to adjust rise and fall time, high 3-A/2.8-A sink/source capability and 4.3-ns rise/3.7-ns fall times at 1-nF output load, and internal undervoltage lockout (UVLO) on the gate driver.

The ISL71043M radiation-tolerant PWM controller is available now in an 8-lead 4-mm x 5-mm SOIC, and the ISL71040M radiation-tolerant low-side GaN FET driver is available in an 8-lead 4-mm x 4-mm TDFN. For more information, see the ISL71043M [product page](#), and the ISL71040M [product page](#).

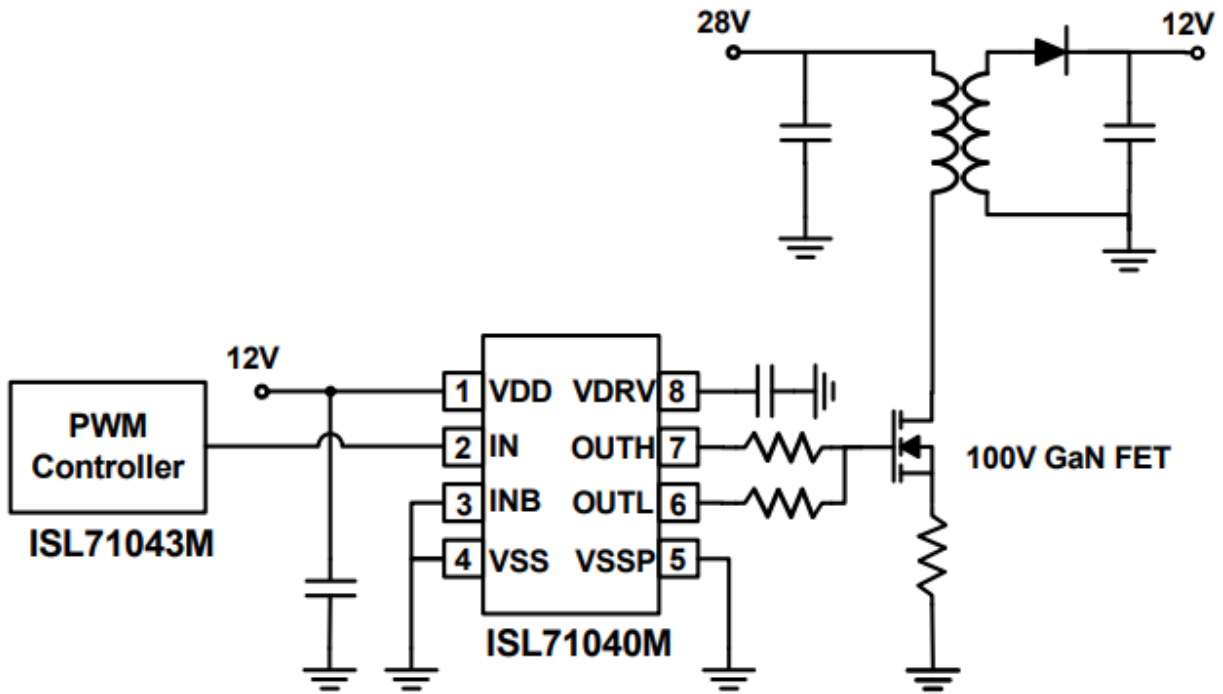


Figure. Block diagram of the ISL71043M single-ended current-mode PWM controller and ISL71040M low-side GaN FET driver in a flyback converter. The ISL71043M is offered in an 8-lead plastic SOIC package, while the ISL71040M is offered in an 8-lead plastic TDFN plastic. Both parts are specified across the extended temperature range of -55°C to +125°C.